

Nutritional and Physiological Disorders in Crop Plants



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Nutritional and Physiological Disorders in Crop Plants

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PREFACE

In recent years, the concept of nutrient management has undergone many changes. With the tremendous advances made in the understanding of the role of various fertility elements, greater emphasis has now been given to secondary and micro nutrients. Introduction of fertilizer responsive high yielding varieties and hybrids led to major and micro-nutrient deficiencies, resulting in loss of soil fertility. Identification of deficiency symptoms for amelioration involves careful observation of crop behaviour and a complete understanding of the nutrient elements in the plant system.

Considering the importance and emerging need in this area, a book on **Nutritional and physiological disorders in crop plants** has been prepared in a simple language. We feel this will help to improve the knowledge on diagnosis of deficiencies of mineral elements and their rectification. The main feature of this guide is the point-by-point description of the various visual deficiency symptoms exhibited by the crop plants.

The book has been written primarily for the students of Agriculture and Horticulture and also for those engaged in this profession.

Madurai
4th December, 2008

**C. RAJENDRAN
K. RAMAMOORTHY
S. JULIET HEPZIBA**

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Deficient element and deficiency symptoms

A. CEREALS

1. RICE

Nitrogen deficiency



- ❖ Stunted growth
- ❖ Reduction in tillering and panicle size
- ❖ Reduction in grain weight
- ❖ Leaf chlorosis followed by necrosis, first in old leaves and then in others
- ❖ A slight delay in heading

Phosphorus deficiency



- Severe stunting at seedling
- Small, erect and dark green leaves
- Reduction in stem thickness

- Lack of tillering
- Delayed plant development and maturity

Potassium deficiency



- ❖ Stunted growth, slight reduction in tillering
- ❖ Short droopy and dark green upper leaves
- ❖ Lower leaves exhibit yellowing of interveinal areas starting from leaf tip and eventually drying as indicated by light brown colour
- ❖ Presence of occasional brown spots on upper leaves

Sulphur deficiency



- Upper leaves display chlorosis similar to N deficiency (as manifested in lower leaves)

- Unlike in the case of N, lower leaves do not become necrotic prematurely with S deficiency

Iron deficiency



- ❖ Entire leaf becomes chlorotic and then bleached to white
- ❖ Symptoms exhibit first on the young and emerging leaves

Zinc deficiency



- Deficiency symptoms exhibited variously like basal chlorosis of leaves, loss of turgidity, delayed plant development; Bronzing and necrosis of leaves and in some cases, death of seedling
- In direct dry seeding cultural system, symptoms often occur shortly after flooding, intensified in deep water
- Initial symptoms are followed by necrosis of entire plant, especially if the flood water is not removed.
- Maturity delayed by 3 - 4 weeks.

Manganese deficiency



- ❖ Stunting of plant and interveinal chlorosis of new leaves (symptoms likely to appear under high pit soils under non-flooded conditions)

Silicon deficiency



- Leaves soft and droopy
- Increased lodging; Presence of brown spots resulting from infestation by Helminthosporium
- Reduced grain yield

2. SORGHUM

Nitrogen deficiency



- ❖ Plants stunted, spindly with pale green to pale yellow coloured leaves

- ❖ Pale to deep yellow colour appears near the tip and margin and advance towards the base and midrib of leaf
- ❖ Under severe deficiency, dark brown necrotic spots develop; leaves turn pale brown, die and bent over or fall down (pendent) on the plant
- ❖ Growth of plant very slow, flowering delayed, leaf size reduced
- ❖ Reduced yield with fewer grains

- Roots turn dark brown, purple or black

Potassium deficiency



Phosphorus deficiency



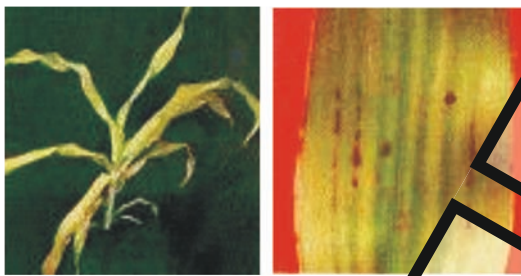
- ❖ Symptoms usually appear in older leaves but in some varieties, middle leaves first affected
 - ❖ Irregular necrotic patterns intermingled with red or brown pigmentation
 - ❖ Symptoms begin at leaf tips and margins and move towards the base and midrib
 - ❖ Necrotic interveinal lesions appear near the margin and sometimes extend for most of the leaf length
 - ❖ Reduced grain yields
- Common during cool weather in young plants, young plants more erect and sometimes leathery
 - Shoot growth more affected than roots, hence shoot root ratio decrease
 - Grain development and filling are inhibited leading to shriveled kernels of poor quality
 - Plants stunted and spindly with low vigour and dark green leaves which have overtone of dark red colouration
 - Symptoms first appear on older leaves and sheaths. Leaf tips and interveinal tissue show red coloration that progresses towards base and midrib
 - Eventually the entire leaf affected

Calcium deficiency

- Severe deficiency causes plants stunted since inter nodes fail to elongate and new growth grows in a rosette form
- Symptoms appear first in newly emerging leaves
- Serrated upper leaves whose margin show irregular bleached or pale green streaking
- Leaves short, erect and easily torn

- Leaf tips fail to unfold, and deformed and they form sword like projection
- These tips sometimes envelop other leaves to form a ladder like appearance with blade tips sticking together
- Leaves brittle turn brown and form sticky residues near margin since apical meristems destroyed
- More tillering

Magnesium deficiency



- ❖ Plants stunted and less vigorous
- ❖ Symptoms first appear on older leaves and then on younger leaves
- ❖ Larger irregular necrotic spots or lesions on leaf tips and margins which progress towards base and midrib

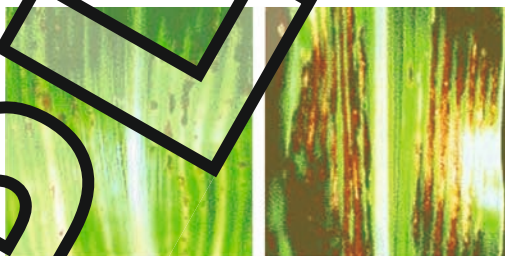
Sulphur deficiency



- First upper leaves turn pale yellow and emerging leaves uniformly pale yellow

- Prolonged deficiency makes older leaves also pale yellow with chlorosis developing first near the tip and advancing along the margin towards the base
- Chlorotic tissue turns brown and leaves die and hang down

Manganese deficiency



- ❖ Initially middle to upper leaves show interveinal lesions near the middle portions, which progress towards the tip.
- ❖ Long chlorotic streaks along with smaller dark brown or red lesions which form a long streak of red / dark region
- ❖ Under mild deficiency veins remain green with long interveinal lesions

Iron deficiency



- Symptoms appear first on young leaves with long yellow interveinal streaks, leaf tips and margin more yellow than midrib or base